Using Assistive Technology with Infants and Toddlers: Evidence - Based Practice

Evidence based practice has been defined as "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p.71). Evidence-based practice is about finding and using accurate and reliable information to influence decisions about what one does in day-to-day practice. The following scientific research presented in this brief provides information of varying levels of evidence that may be useful for health care, education, and early intervention personnel in the designing of specific intervention plans for infants and toddlers using assistive technology.

Assistive technology (AT) enables infants and young children with disabilities to participate in daily routines and activities and facilitates mobility, communication, and other primary life functions. Assistive devices range from readily available, off-the-shelf and generally low cost devices to those with limited availability that are designed to address the specific issues of disability. Readily available items may be used by all children and include bath seats, car seats, strollers, and other positioning equipment as well as toys, spoons and bowls, and other items used by young children. These items are often labeled as low-tech. Specialized devices are generally more complex and include computer-based communication devices, highly specialized switch interfaces, power wheelchairs, computerized toys and other devices that are not readily available for use by the general population. These devices are frequently labeled as high-tech.

Once an appropriate device has been selected for a particular child, strategies or interventions are needed to teach him/her to use it effectively and efficiently within the context of his/her routines and activities. The following questions and their respective, evidence-based answers are designed to make practitioners aware of the best practices for teaching children ages birth to three to incorporate assistive technology into their daily lives. Tables following the AT questions include references of evidence-based articles, as well as the details of those particular studies and their "take home message" for practitioners.

1. ***What Do We Know About Teaching Young Children to use Power Mobility Devices?***

Locomotion is one of the foremost ways that young children learn to interact with their environments. Exploring one's environment can not only facilitate curiosity and initiative, but also provide a sense of competence in oneself. Immobility during the first three years of life can lead to a persistent pattern of apathetic behavior and depressed motivation (Butler, 1986), and can lead to a lack of self-initiative and feelings of helplessness throughout the subsequent course of development. Powered mobility devices can

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act as alternative forms of locomotion and can help improve the social, emotional, and psychological development of a child with disabilities.

Several studies (Butler, Okamato, & McKay, 1983, 1984; Butler, 1986) have provided findings about the best ways in which powered mobility can be introduced to young children.

	Study Details	***Take Home Messages***
Powered Mobility for Very Young Disabled Children *(Butler, Okamato, & McKay, 1983)* *Motorized Wheelchair Driving by Disabled Children* *(Butler, Okamato, & McKay, 1984)*	• Twenty-two total children ages 20-37 months with average cognitive abilities for their chronological ages and varying physical disabilities. • Children fitted for optimal size wheelchairs based on their individual needs and positioned for optimal performance. • Children learned to drive wheelchairs at home under parental supervision; maximum opportunities to practice at home. Parents recorded wheelchair use. • Competence in driving determined when the following seven skills were mastered: stopping and starting, driving straight in open areas, driving straight in narrow corridors, turning around, turning corners, and coming in close proximity to people and furniture	• A majority of children mastered driving in an average of three weeks. • Butler et al. 1983: Children used wheelchairs for an average of two to four hours daily, seven days a week for one month. • Butler et al., 1984: Children's cumulative period of use was calculated to be 13.8 days with time sitting in the chair averaging 34.4 hours and actual movement in chairs averaging 8.1 hours. • Butler et al., 1984: Children demonstrated a pattern of clustering in which four to five skills (e.g. Forward maneuvering and start/stop) were learned in a short period of time. • Butler et al., 1983: Parents provided anecdotes regarding the positive influence on child's social, emotional, and intellectual behavior.
Effects of Powered Mobility on Self-Initiated Behaviors of Very Young Children with Locomotor Disability *(Butler, 1986)*	• Six children ages 23-38 months with varying physical disabilities; all have normal intelligence and adequate upper-limb functioning. • Baseline: No powered mobility • Treatment phase: independent powered mobility. • Measuring baseline behaviors: two-hour samples of behavior were video recorded in 10-day intervals in natural setting in home. • Children then received motorized wheelchair and learned to use it to levels of proficiency. • Observed for self-initiated behaviors (e.g. rate of physical interactions with objects, communication, and change of location)	• Mixed results: While some children decreased in two behaviors, treatment was effective for some behaviors for all children. • For more verbal and demanding children, the decreases in communication were actually positive outcomes. • Three children had increased frequencies in all self-initiated behaviors.

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2. ***What Do We Know About Teaching Young Children to use Augmentative and Alternative Communication Devices?***

One of the most frequent goals of young children with disabilities using assistive technology is the improvement in language and communicative skills. An augmentative and alternative communication (AAC) system is an integrated group of components, including the symbols, aids, strategies, and techniques used by individuals with disabilities to enhance communication (Vanbiervliet & Parette, 2002). AAC devices can enhance the vocal communications of children with disabilities by increasing interactions and language skills and by building upon existing vocalizations to make them more useful in accomplishing communicative tasks. Learning to use AAC devices during formative years is especially important for early communication development in young children at risk for expressive communication impairments (Cress & Marvin, 2003). Communicative functions learned at early ages may include greetings, protests, requests for attention or objects, and termination of an activity and may include the learning of new concepts and words through the use of routines and scripts.

Study	*Study Details*	*Take Home Messages*
Increasing Communicative Interactions of Young Children with Autism Using A Voice Output Communication Aid and Naturalistic Teaching *(Schepis, Reid, Behrmann, & Sutton, 1998)*	• Four children with autism, ages 3-5; functioning ranged between the 18- 24- month level. • VOCAs: Involve activation of a device to provide recorded or synthesized speech. • Careful selection of specific VOCA to use with each child involved classroom staff, clinician trained in AAC, and child. • Taught children how to use VOCA for daily snack and play routines at school. • Experimenters observed child and teacher/aide communication behaviors during snack and play times. • Naturalistic Instructional Strategy: (a) using child-preferred stimuli available within the natural routine, (b) using child-initiated responses as the point of intervention, and (c) providing verbal and gestural prompts with minimal use of physical guidance. • Child's initiation of communication response could be evoked through physical approach, expectant delay, or questioning looks and eye contact.	• All children displayed an increase in communicative interactions during the VOCA and naturalistic teaching conditions. • Communicative interactions that were VOCA responses averaged 93%, 82%, 89%, and 36% of all of the interactions for the four children. • All children used their VOCAs to request items, respond to questions, and make social comments during their play and snack routines. • Results support and extend findings of previous research examining VOCA use by children with severe disabilities (e.g. Schepis, Reid, & Behrmann, 1996; Soto, Belfiore, Schlosser & Haynes, 1993).

3. ***What Have Been Found to Be the Best Ways to Design and Select Prosthetic Limbs For Young Children?***

Before the availability of the world's first child-size electric hand in 1970 at the Ontario Crippled Children's Center, powered prosthetic components were used only for the rehabilitation of adult upper extremity amputees (Sauter, Dakpa, Hamilton, Milner, & Galway, 1985). It was not until Sorbye's (1977) research that a child-sized myoelectric hand system was introduced. Since then, some researchers have studied the design and selection processes as well as the efficacy of myoelectric (Mendez, 1985; Meredith, Uellendahl, & Keagy; Sauter et al., 1985; Zazula & Foulds, 1983) and cable-actuated (Krebs, Lembeck, & Fishman, 1988) prostheses. These researchers have emphasized the need for devices that are more durable, esthetically pleasing, cost effective, lightweight, strong, and accepted by children with disabilities and their parents.

Study	***Design of Prosthetic***	***Study Details***	***Take Home Messages***
Acceptability of the NYU Number 1 Child-Sized Body-Powered Hand *(Krebs, Lembeck, & Fishman, 1988)*	• Contoured structural frame accepts the same glove as the Swedish hand, but houses a cable-actuated mechanism. • Structure has a thumb, index, and middle finger, while the ring and fifth fingers are passively mobile for cosmetics. • See Krebs et al. for full description of design.	• 23 three- to five-year-old children with unilateral below-elbow amputations and history of good prosthetic use. • Patient and parental reactions obtained at time of entry and 3 months later. • Questions based on reactions to weight, ease of operation, gripping adequacy, and child's frequency and duration of use • Performances on ADLs also rated.	• Most liked features: appearance, strength of grip, more willing to use than hook, fewer comments from strangers, and easier grasp and release. • Least liked features: glove durability, unable to fully open, max finger opening too small, passive fingers too small, color of glove, glove impedes wrist rotation • Appropriate sizing should be considered during selection process.

Study	Design of Prosthetic	Study Details	Take Home Messages
Evaluation of a Myoelectric Hand Prosthesis for Children with a Below-Elbow Absence *(Mendez, 1985)*	• Myoelectric hand prosthesis. • Digital readings can be set for flexion and extension sensi tivity. • Rotates 360°. • External 6-volt battery worn connected by cable to prosthesis.	• 87 children ages $3^{1/2}$ to $4^{1/2}$ years-old with single, below-elbow amputations and prosthetic-wearing experience. • National trial conducted at 3 centers. • One-week intensive training for mother and child conducted by experienced occupational therapists. • Parent recorded diaries	• Rejection rate was 20% (18 children); 20% wore intermittently; 60% wore continuously, used it effectively, and benefited. • Parent's expectations fulfilled in 75% of cases. • With these results the Department of Health and Social Security accepted this prosthesis for young children and it is available through National Health Services Limb Fitting Service.
Prosthesis with Electric Elbow and Hand for a Three-Year Old Multiply Handicapped Child *(Sauter, Dakpa, Hamilton, Milner, & Galway, 1985)*	• Myo-electrically controlled elbow and hand. • Design and materials differed considerably from conventional above-elbow prosthetic socket. • See Sauter et al. for full design description.	• Single patient, 2 ½ years, bilateral upper limb hemimelia to both humeri. • Patient observed member from therapy staff first before trying it herself. • Parents instructed to teach the procedures to their child with the understanding that this occurred at home until patient reached certain level of control.	• 18 months after supplying the prosthesis, the child continued to wear it daily, has achieved good control, and uses it effectively. • It is planned to use the same design on other patients.
Successful Voluntary Grasp and Release Using the Cookie Crusher Myoelectric Hand in 2-Year-Olds *(Meredith, Uellendahl, & Keagy, 1993)*	• Cookie Crusher: externally powered myo-electric control scheme • Hand opens in response to muscle contraction. Vs. • Cable-operated voluntary opening mechanical device.	• Two 2-year-old children (1 boy, 1 girl) • Each child observed using both types of prostheses. • Children's ability to open and close his or her prehensor voluntarily during bimanual play was observed during each amputee outpatient clinic and occupational therapy appointment.	• The Cookie Crusher control scheme for grasp and release works better with young children than the cable-operated hook and hand. • The prosthetic is designed with automatic, uninhibited associated movements. • Additional advantage of cosmesis. • Disadvantages: cost, need for special technological support for repair, etc.

Study	Design of Prosthetic	Study Details	Take Home Messages
Mobility Device for a Child with Phocomelia *(Zazula & Foulds, 1983)*	• An electric cart made of urethane foam and fiberglass shell. • Moves in all directions. • Foot switch. • Child sits vertically. • Can accommodate growth until transition to commercial wheelchair.	• 11-month-old boy with multiple limb deficiencies. • Child was presented with the cart for preliminary trial; opportunities to become familiar with it (e.g. sitting on floor and controlling with remote switch, riding in it while parents controlled it, etc.) • More familiarization at home.	• By end of preliminary trial, child making attempts to activate foot switch independently. • Child displayed complete control by 6 months. • Good speed / power of cart, and large wheel spacing for low center of gravity.

4. *How Do Microcomputers Compare to Other Teaching Strategies When Working with Very Young Children With Disabilities? How Can I Teach Young Children with Disabilities Through the Use of Such Computers?*

The effects of using computers for education, although important for all children, can be especially pertinent for children with disabilities. "The potential of mainstreamed programs to promote social skills in handicapped young children has been of particular interest to educators and researchers" (Spiegel-McGill, Zippiroli, & Mistrett, 1989, p. 249). In addition to facilitating social competence for these children, computers can increase cognitively complex and imaginative verbalizations (as cited in McCormick, 1987), promote motivation, attention to task, fine motor and visual scanning skills, and enhance the development of expressive speech (as cited in O'Conner & Schery, 1986). Computers are adaptable and reactive and have the ability to simulate learning activities that children with disabilities may find difficult to master. There have been reservations, however, about the use of computers in the classroom. For example, in the past, some have feared that computers may replace traditional learning methods such as manipulation and imaginative play. The following researchers have conducted research studies that examine how microcomputers, as compared to more traditional teaching methods, can affe ct the social, communicative, and other developmental skills of young children with disabilities.

Study	Teaching Strategies	Study Details	Take Home Messages
Comparison of the Effects of a Microcomputer Activity and Toy Play on Social and Communication Behaviors of Young Children *(McCormick, 1987)*	• <u>Computer</u>: Apple II e with color monitor and Muppet Learning Keys keyboard and software • <u>Toy</u>: Fisher Price Garage and accompanying small toys on floor.	• Five children ages 3-6 years (2 with social and language delays) • Dyads did two 10-min sessions a day, one toy play and one computer play; children played as they wished. • Vocalizations and play behaviors recorded.	• Dyadic computer activities provided children with motivating contexts for practice, expansion, and refinement of social and language skills. • Results may not be generalizable.

Study	Teaching Strategies	Study Details	Take Home Messages
Microcomputers as Social Facilitators in Integrated Preschools *(Spiegel-McGill, Zippiroli, & Mistrett, 1989)*	• Microcomputer condition: computer and robot set up in classroom, but no battery in robot • Toy Robot condition: same as 1st condition but computer unplugged. • 3rd condition: both activities were available but turned off.	• Eight children ages 4 to 5 • Alternating treatments design • Three play conditions were compared. • Data: percentage of the 5 min. intervals each subject engaged in socially directed behavior with dyad partner	• The two children with most severe social disabilities engaged in more socially directed behaviors when playing with a friend on the computer. • Reactivity of the computer & diverse programs affect play. • Children with mild disabilities interacted in the same way in all 3 conditions.
Microcomputer-Based Instruction in Special Education *(Lehrer, Harckham, & Pruzek, 1986)*	• Logo-based learning: commercial software keyed to child's individualized education plan; drill-and-practice. • "Skills" approach: teacher-selected software for individual's education plans. • Control condition: teacher-directed activities in classroom.	• 120 preschool (2-4 yrs) special needs children in NY. • Randomized block design; 8 blocks (based on child performance characteristics), 3 treatments • Data: children's cognitive dev., problem solving, skill acquisition, affective dev., language dev.	• Significant differences b/w Logo and control conditions→Logo enhances the problem-solving skills of children with disabilities. • Children in condition 2 also benefited from their interaction with software keyed to their individual needs. • Authors say that questions concerning quality of software should consider learner characteristics.
A Comparison of Microcomputer-Aided and Traditional Language Therapy for Developing Communication Skills in Nonoral Toddlers *(O'Conner & Schery, 1986)*	• Computer-aided intervention: software developed for delayed children 18 mths –5yrs; presents pictures representing vocab items • Traditional Language Intervention: child and clinician played together with toys; discussions to enhance vocabulary.	• Eight 2- to 3-year-olds; 6 with down syndrome, 1 with developmental delays, 1 with severe emotional disability • Within-subjects design: each subject received 12 20-min intervention sessions • Measures administered to children before, during,after interventions+ Parent and teacher reports.	• When microcomputer was used in interactive mode (e.g. guided by teachers) it does facilitate language growth. • When these devices are used with accompaniment, they can help these children become more effective communicators. • No *significant* treatment effect

Study	Teaching Strategies	Study Details	Take Home Messages
The Importance of Structured Computer Experiences for Young Children With and Without Disabilties *(Parette, Hourcade, & Heiple, 2000)*	• Field test of the "Keyboard Kids Curriculum" (a computer teaching program)	• Three classrooms of children ages 3-5 years. • ½ of children had disabilities. • Computer Skills Testing Inventory used as pretest and posttest to determine progress in acquiring computer skills. • Each group received 1-hr training session 2x/wk • Teachers worked with groups of 3.	• Significant training effects revealed for all three age groups. • Structured computer skills training using Keyboard Kids Curriculum was effective in teaching young children with and without disabilities.

5. ***How Can I Teach Response-Contingent Learning Through the Use of an AT Switch Apparatus?*** Early motor actions and environmental manipulations are vital for a child's overall development. "The physical manipulation of objects is a major contributing factor in the development of cognitive and language skills" (Cook, Liu, & Hoseit, 1990, p.51). Because children with disabilities may find it particularly difficult to engage in some motor activities, switches are often used as assistive technology devices. There are several types of switches that can be used to help young children with disabilities to perform activities involving environmental control. Toys, for example can be made easier to use with the addition of simple switches. Switches are also used with microcomputers in situations where either the computers act as mediators between switches and toys or the computer programs themselves are activated by the switches. Switch-operated mechanisms are often used for teaching children with disabilities response-contingent concepts. Contingency learning refers to an individual's understanding that certain behaviors produce certain rewards or external stimuli. Switches used with toys and computer programs can facilitate the learning of response-contingent concepts, which can subsequently be applied to concepts of everyday environments and further enhance cognitive development. Several researchers have specifically examined ways in which children can be taught to obtain switch-activated reinforcements.

Study	***Switch Apparatus***	***Study Details***	***Take Home Messages***
Use of Assistive Technology With Young Children With Severe and Profound Disabilities *(Daniels, Sparling, Reilly, & Humphry, 1995)*	• The "Big Red" switch used with Universal Timer • Apple II GS computer and "Switches, Pictures, and Music" software. • Choice of brightly colored pictures • Switch-activated toys provided 3-D visual feedback	• Two children: 40 and 24 months • Treatment A (Big Red) vs. Treatments B and C • Alternating treatment design with baseline measurement. • Children held in sitting position on floor and switch on bench in front of them; computer or toy on bench • Action to use switch demonstrated at first • Verbal cueing: "hit the switch" intermittently	• Dependent Variables: Frequencies of switch activation, orientation to stimulus, and attention to stimulus • Both had increased frequencies of independent switch activation and attention over first 3 phases. Also increased frequency of attention but at less pronounced level. • Allowing sufficient time for interaction with switch at start important for facilitating independent switch activation.
Robotic Arm Use by Very Young Motorically Disabled Children. *(Cook, Liu, & Hoseit, 1990)*	• Apple II e microcomputer trains arm to move • Robotic arm: ½ adult human scale; smooth human-like movements. • Single switch activates movements.	• Birth to 3: six children with delays and three without. • Initial measures of children's developmental levels. • Parents chose arm mvnts. • Child taught pressing switch caused arm to move. • Experimental phase: will child use arm as "tool" to reach object?	• Children who met criteria for interaction with the arm all used it as tool by pressing only when necessary. • 3 children with disabilities used it as tool; all able-bodied children did. • All could use switch to control contingencies. • No one afraid of arm.

Study	Switch Apparatus	Study Details	Take Home Messages
An Analysis of Response-Contingent Learning Experiences for Young Children. *(Hanson & Hanline, 1985)*	• Electromechanical devices designed to teach functional skills. • Effective reinforcers selected depending on the child's needs.	• Three children ages 8-25 months; spastic quadriplegia, down syndrome, and cerebral palsy. • Experiments conducted in homes with parents. • Different procedures for each child. • When children pushed/kicked→reinforcements (e.g. parents came, visual stim., or vibrations) • Dependent Variables: frequency of responses	• Children with severe disabilities can learn to increase the frequency of specific responses with contingent feedback. • Teaching procedures were effective; electronic devices can be used as a substitute for parents providing continuous feedback to child when he/she initiates or responds to environment.
Response-Contingent Learning in Profoundly Handicapped Infants: A Social Systems Perspective *(Dunst, Cushing, & Vance, 1985)*	• Visual display with multicolored lights arranged in circular pattern • Attached to side of crib and displayed above head.	• Six profoundly retarded male infants. • Infants in crib in supine position with supports. • Baseline: display not lit. • Conditioning: display lit whenever child emitted fixated head turn response. • Length of illumination variable (from 2-4 sec)	• 4 out of the 6 infants learned response. • With right environment, even children with the most severe disabilities can learn. • Conditioning possible when conducted across several days and in a single session.
Contingency Intervention: A Program Portrait *(Sullivan & Lewis, 1990)*	• Equipment included: computer, contingency interface, software, adaptive toys, switches, mounting panel.	• 40 infants ages 2.5-15.5 months; mental ages from 2-10 months; gross and fine motor delays. • Pretest: Bayley Scale of Infant Mental Development • Equipment taken home and parents taught to use. • Babies in front of play board with both contingent and noncontingent switches. • Child taught basic contingency concepts	• Evidence of learning for 19 out of 20 experimental infants. • Parents positive about program. • 80% of mothers saw evidence of the child extending the experience in the project to everyday situations (e.g. more reactions to toys, more alert and/or interested).

Study	Switch Apparatus	Study Details	Take Home Messages
Effects of a Small Group Microcomputer-Mediated Motor Skills Instructional Package *(Horn, Warren, & Reith, 1992)*	• Apple II e computer with Omnibox; Omnibox attached to interface board and had plugs for single-switch inputs. • "Switchmaster"	• 6 children, all with cerebral palsy and multiple disabilities. • Trainers provided with specific implementation instructions. • Condition A (motor instruction package): children positioned in adaptive seating and set of 3 or 4 toys available; trainers praised when used. • Condition B (microcomputer-mediated teaching): adaptive switch recorded and monitored performance of target behaviors and cued trainers when to prompt.	• Consistent relationship between introduction of computer package and improvement in children's engagement and target motor performance. • More consistent material contingent feedback from battery-operated toys was demonstrated in computer condition.
Assistive Technology for the Very Young: Creating Responsive Environments *(Sullivan & Lewis, 2000)*	• Adapted switch toys mounted on special panels. • Two switches on playboards: one, the "response-to-be-learned" and the other, a non-responsive switch.	• 120 infants under 18 months; down syndrome or cerebral palsy. • Slight arm mvnts that might not otherwise result in an environmental consequence resulted in activation of toy or music through use of switch. • Infants taught effective means of controlling it and provided a sequence of contingencies. 12-wk intervention.	• More than 75% of parents said children had become more interested in toys by the end of intervention. • Most efficient learners required more toys because became bored with them more easily. • Those more delayed attended to toys as much as those less delayed. • Intro of contingencies promotes attention infants with severe delays.

Study	Switch Apparatus	Study Details	Take Home Messages
Facilitating the Acquisition of Sensorimotor Behavior with a Microcomputer-Mediated Teaching System: An Experimental Analysis *(Horn & Warren, 1987)*	• Combo of adaptive equipment for supporting child. • Microswitches to monitor child's correct motor movements. • Adapted battery-operated toys for reinforcers. • Apple II e microcomputer as mediateor between target responses and reinforcers.	• Two children, 17 and 24 months old; severe motoric delay. • Multiple probe across behaviors design. • Three motor skills defined: sitting, pulling, kneeling for one child and sitting, batting, and 4-pt positioning for the other. • Baseline: no prompting and contingent reinforcement; toys randomly activated. • Training sessions: teachers positioned child, switch, toy and followed prompting hierarchy in one of two sessions.	• Substantial increases in levels of performance when contrasted to baseline. • Performance on stimulus generalization probes indicated all three skills increased from 0% at baseline. • Maintenance probes on three skills, two & four wks later, indicate performance near or slightly below training levels. • Third set of skills were learned quickest. • Support for effectiveness of neuromotor/behavioral intervention procedure.
Baby-Babble-Blanket: Infant Interface with Automatic Data Collection *(Ferrier, Fell, Mooraj, Delta, & Moscoe, 1996)*	• BBB: A multiple microswitch-activated pad controlled by a Mac computer and software. • Pad has pressure switches that can be activated by kicking or rolling. • Records mother's speech to motivate infant. • Automatic data collection system.	• A five-month old infant with club feet, hydrocephaly, and poor muscle tone. • Prelim. visit to introduce BBB to child and parents. • Filled out subject state form with every use of BBB. • Mother placed child on blanket 5 times/week when awake and alert. • To determine use of particular body pars, sounds produced when used only 1 body part and then switched.	• Lying on his back, infant able to activate two switches easily (under the head and under his bottom). • Infant seemed to use the BBB for cause and effect behavior; learned certain movements in order to be rewarded with his mother's digitized voice. • Digitized sounds useful resource for providing young infants with contingency training or communication system.

Study	Switch Apparatus	Study Details	Take Home Messages
Use of Systematic Prompting and Prompt Withdrawal to Establish and Maintain Switch Activation in a Severely Handicapped Student. *(Meehan, Mineo, & Lyon, 1985)*	• Battery toy: 1-ft. high monkey that played drum and blew whistle when activated. • Electronic switch to activate toy: Zygo tread switch connected to toy with wire.	• Five-year-old male with sever spastic quadriplegia. • Dependent Variable: %age of trials in which student depressed switch. • Design: Alternating treatments and sequential withdrawal • Baseline: verbal but no physical prompting. • Phases II-IV: alternating b/w two treatment conditions; physical + verbal prompting and verbal prompting only. • Phase V: baseline again, only verbal prompts.	• Phase II: Full physical prompt: activations began to increase rapidly; remained high for phases III and IV. • Switch activation response quickly and efficiently established at high level using prompting. • Response remained high with just verbal prompts. • Switch response remained high when physical prompting withdrawn.
Teaching Automatic Linear Scanning for Computer Access: A Case Study of a Preschooler with Severe Physical and Communication Disabilities. *(Light, 1993)*	• Head-mounted single switch on wheelchair to access a microcomputer system. • Elementary Mod Keyboard (EMK)	• A 4 year, 11 month old girl with cerebral palsy with sever spastic quadriparesis. • Head rotation to right was her most consistent movement. • Task: Select correct picture from 5 by activating switch, which resulted in animated display of selected item. • Instruction maximized familiarity of situation for child, highlighted relevant cues, and minimized the number of items of information to be coordinated—Used "tag" as a metaphor for teaching.	• Instructional program effective in teaching child to use automatic linear scanning • Some generalization from easier to more complex steps. • Study suggests merit of an instructional program based on cognitive & developmental competencies.

Study	Switch Apparatus	Study Details	Take Home Messages
Critical Learning: Multiply Handicapped Babies Get On-line. *(Behrmann & Lahm, 1983)*	• Apple II+ microcomputer • Votrax Type 'N Talk voice synthesizer • Color TV monitor • Custom made switches as input devices.	• Five children: 3 non-disabled (11-14 month old), & two multiply-disabled (25 and 27 months). • 8 levels of use ranging from establishing a cause/effect relationship to using a menu driven program; different kids tested at different levels. • Switch-activated feedback: fun, rewarding picture with auditory (level 2), same response but for correct selection (levels 4-6), and direct action (levels 3, 7, 8)	• Infants and toddlers with disabilities seem to understand the cause/effect relationship b/w the computer screen and their switches. • Response time can become adequate and consistent within very short period of time.

Conclusion:

This brief presents evidence for various ways in which health care and education providers can teach the use of assistive technology devices to infants and young children with disabilities. Specifically, the articles discuss how several different types of assistive technology, including power mobility, AAC, switch activation, and computers can be used by children with disabilities to accomplish functional tasks. Some of these articles also discuss the importance of the design and selection of AT when working with very young children. Both the "take home messages" and the details regarding the intervention procedures that result from a review of pertinent literature are useful to inform practice decisions. The "take home message" informs the reader about whether or not the intervention was effective in a given situation, whereas the details provide useful information about the design of a specific intervention and how it can be implemented within a child's routines and experiences (Muhlenhaupt, 2004). Using evidence to guide the selection and use of a particular AT practice is pertinent not only to the success of that intervention, but also to the overall well being of the child.

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